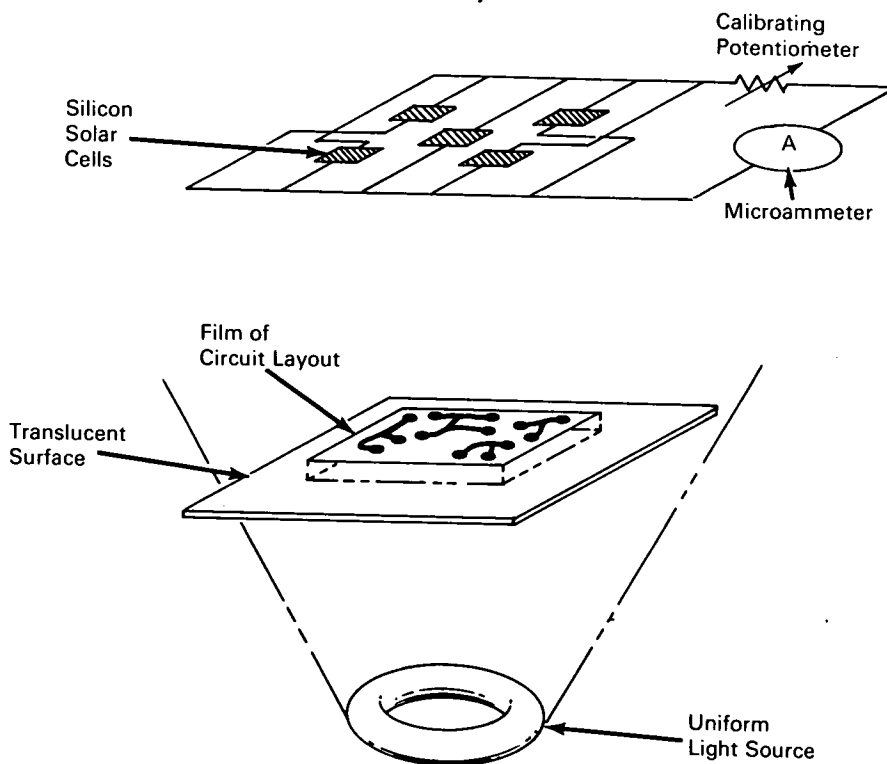


# NASA TECH BRIEF



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## Areas of Irregular, Discontinuous Patterns Rapidly and Accurately Measured



A simple, rapid, and accurate method has been devised for measuring the surface area of a pattern such as comprised by the conductors on a printed circuit board. The measurement problem for printed circuit boards is especially difficult because the conductor paths are curved, of varying widths, and often spaced in irregular arrays. In addition, the measurement must be made without physical damage to the circuit pattern. An accurate measure of the conductor surface area is required to establish the proper current

density for electroplating the conductor pattern on the circuit board.

A measurement is carried out by placing a negative or positive film of the circuit layout over a uniformly illuminated (backlighted) translucent surface and determining the proportion of light transmitted through the clear area of the film to silicon solar cells. A microammeter is used to measure the output of the solar cells. The microammeter is calibrated to give a reading of the pattern area in square inches by

(continued overleaf)

switching on the light source when clear film is on the translucent surface and adjusting a potentiometer in the solar cell circuit so that the microammeter reads one microampere per square inch of illuminated surface. In an actual measurement, then, light energy that is normally transmitted to the solar cells through the clear film is reduced by an amount proportional to the surface area of the opaque conductor pattern on the photographic film.

This direct-reading method is considerably more accurate and faster than previous methods of estimating the extent of complex, discontinuous areas. A measurement can be made before the printed circuit board is produced, an advantage not provided by either capacitance ratio methods or weight loss methods, both of which require sample printed circuit boards for the measurement. In these methods, the

sample boards must generally be discarded after the measurement is completed.

**Notes:**

1. This method of surface area measurement is applicable to any flat, opaque pattern.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
Greenbelt, Maryland 20771  
Reference: B67-10674

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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